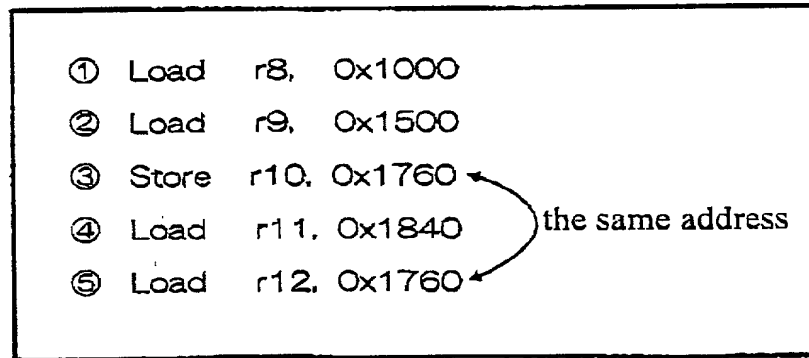


FIG. 1 prior art



instructions (1), (2) and (4) : no dependency : replaceable

instructions (3) and (5) : dependency : the order (3) → (5)

examples of replacing



FIG. 2 prior art

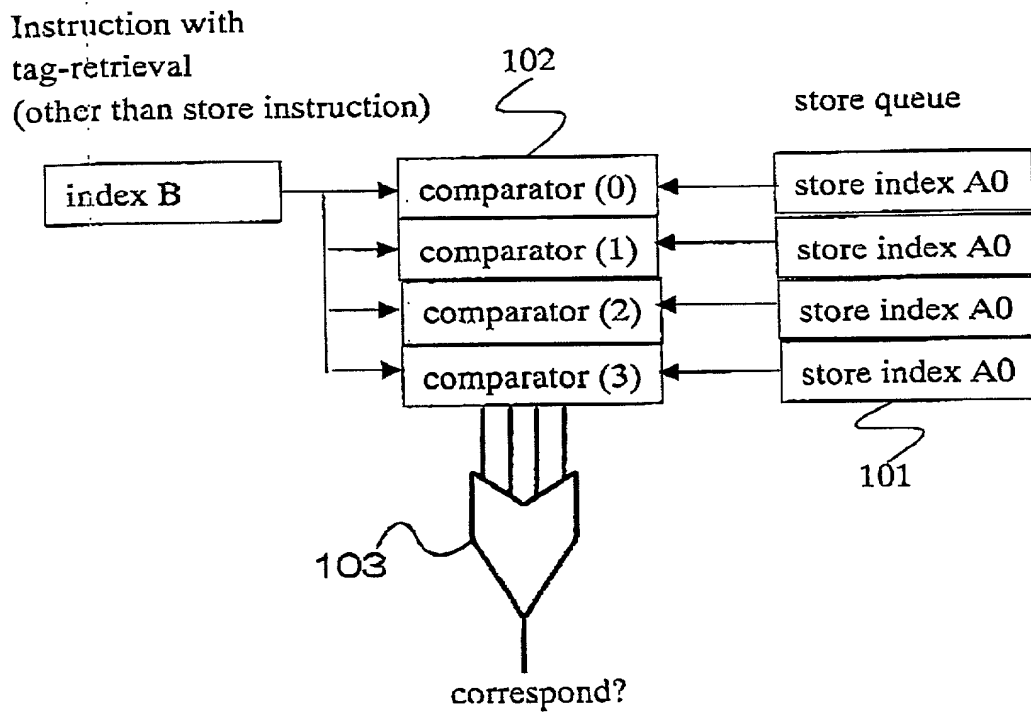


FIG. 3 prior art

High order

Low Order

Page frame number (tag)	Index	Off-set
-------------------------	-------	---------

FIG. 4 prior art

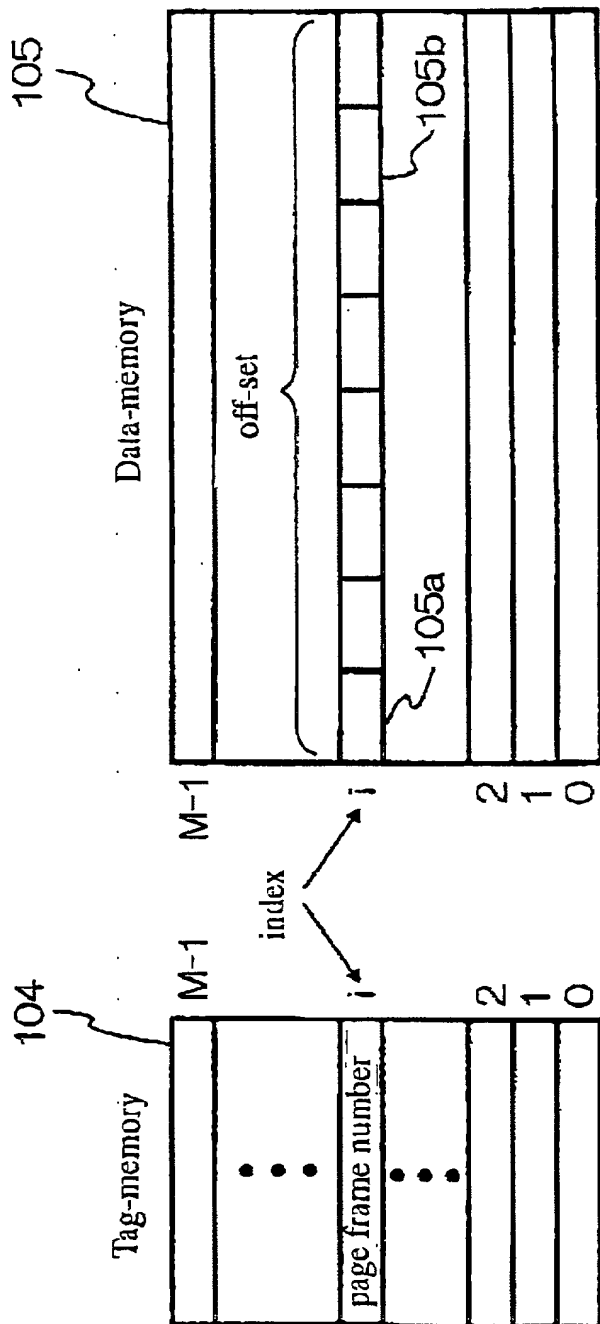


FIG. 5 prior art

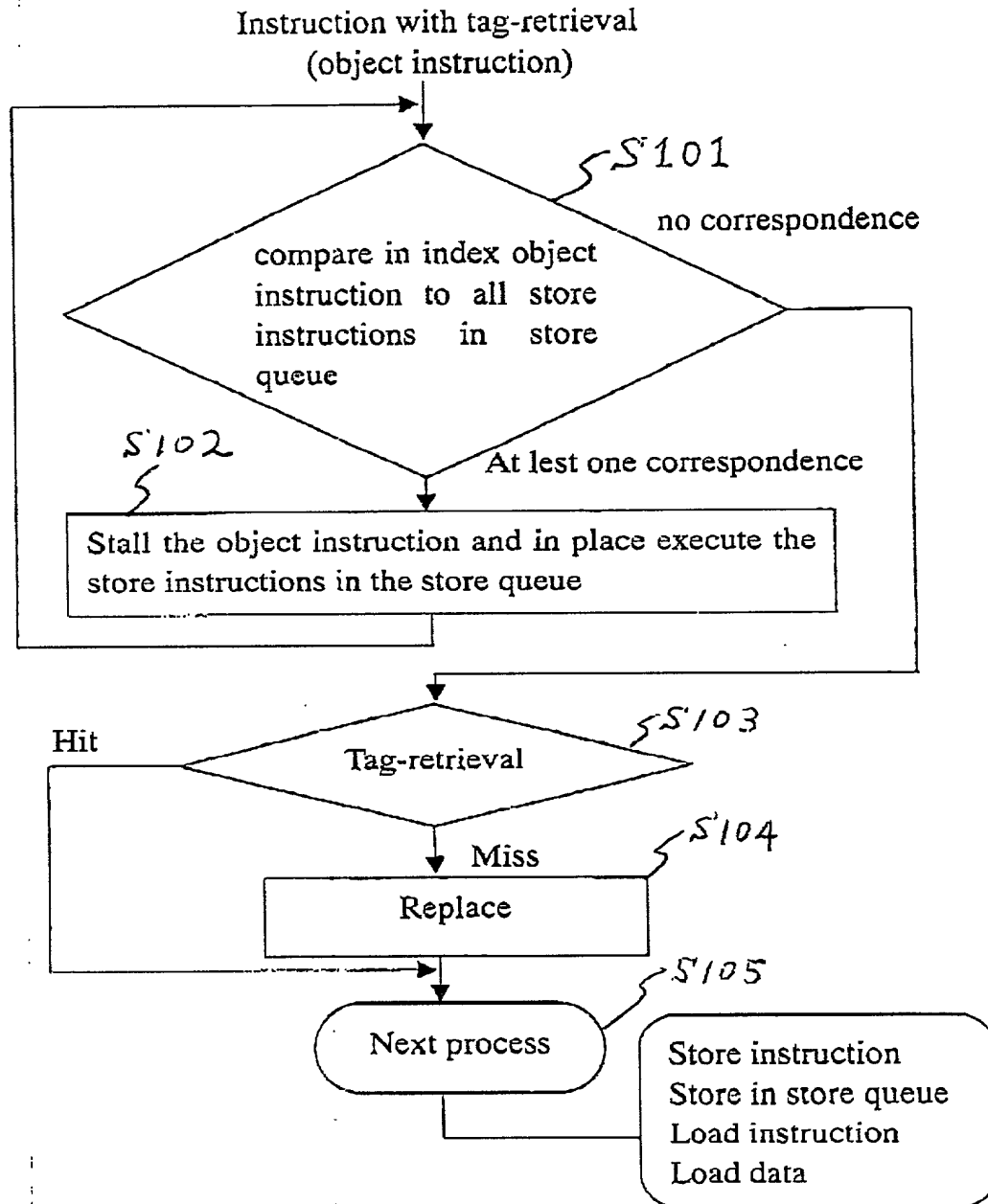


FIG. 6

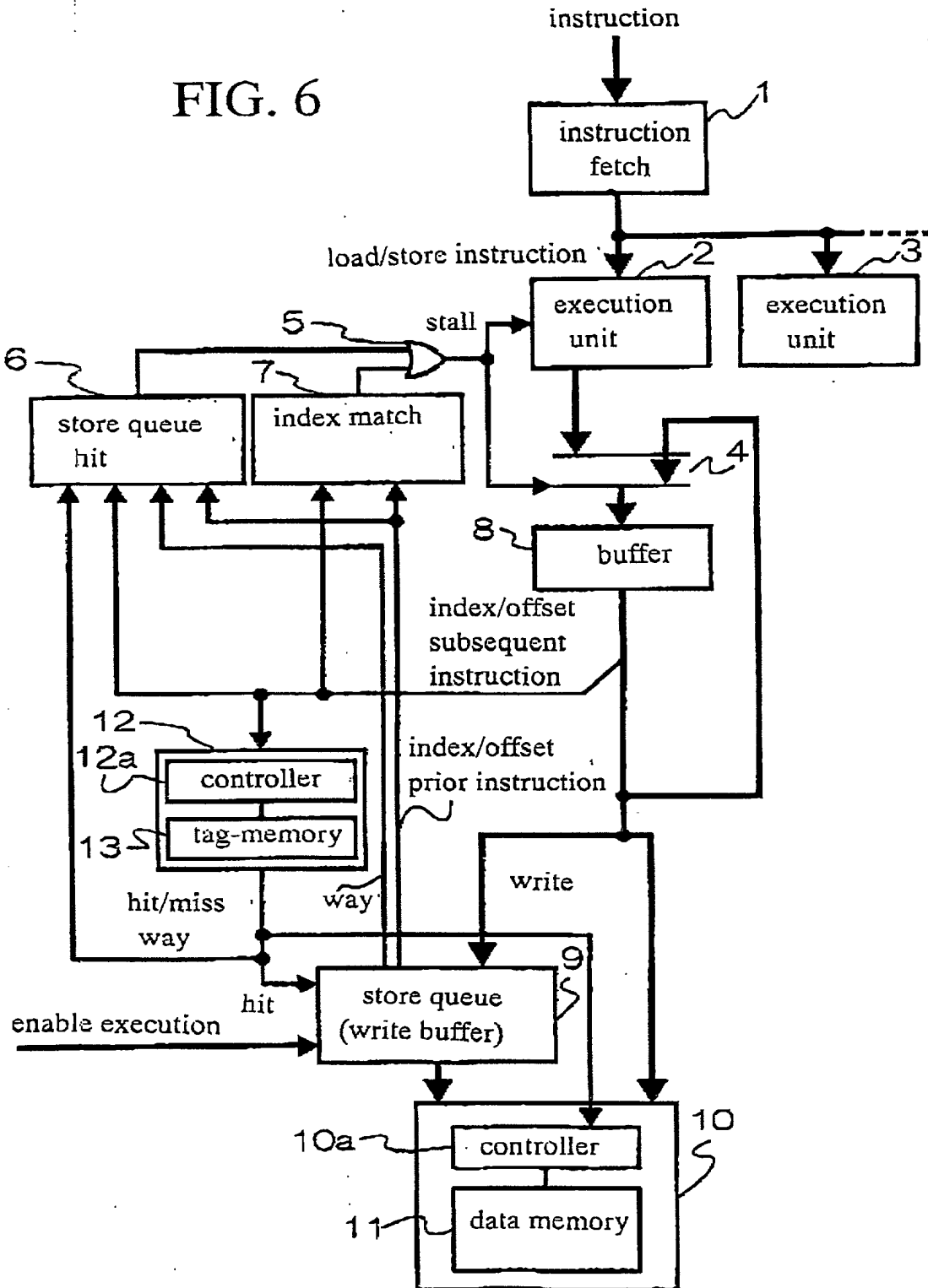


FIG. 7

9

ID	page frame number	index	off-set	way	...
0					...
1					...
2					...
⋮	⋮	⋮	⋮	⋮	⋮
n-1					...

2006101235001 10653771.013003

FIG. 8

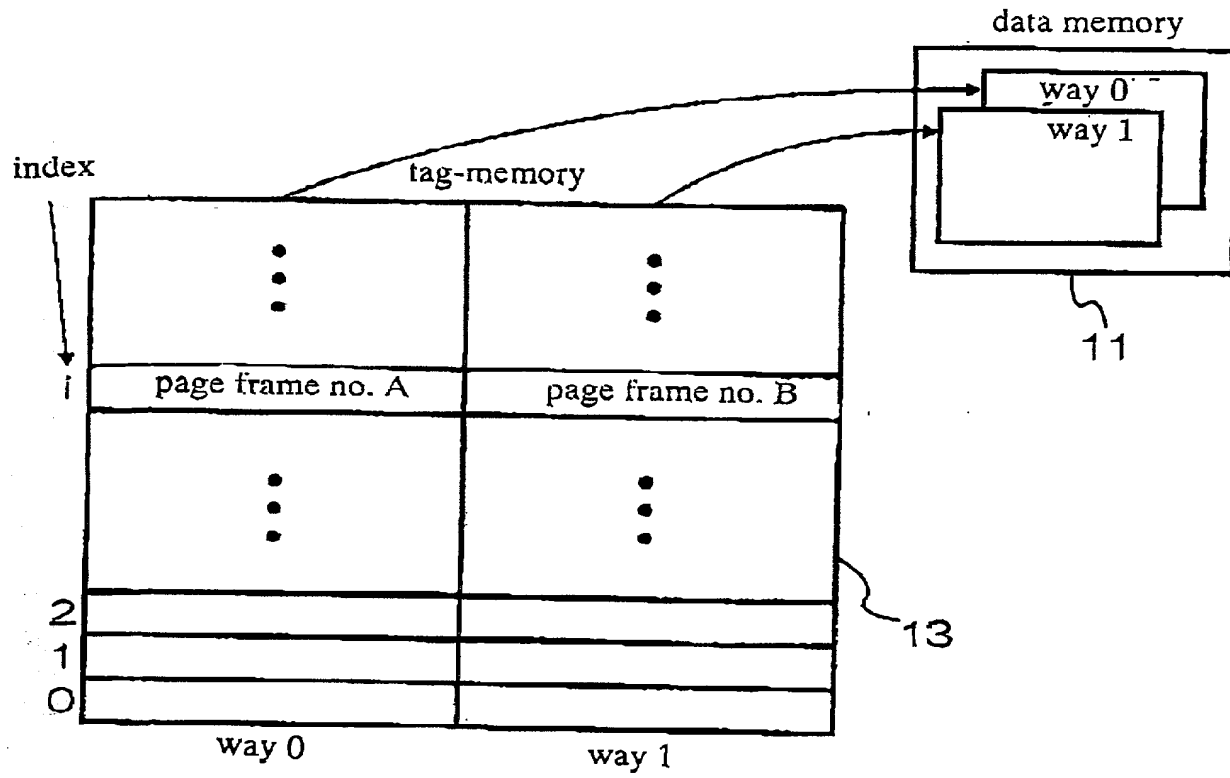


FIG. 9

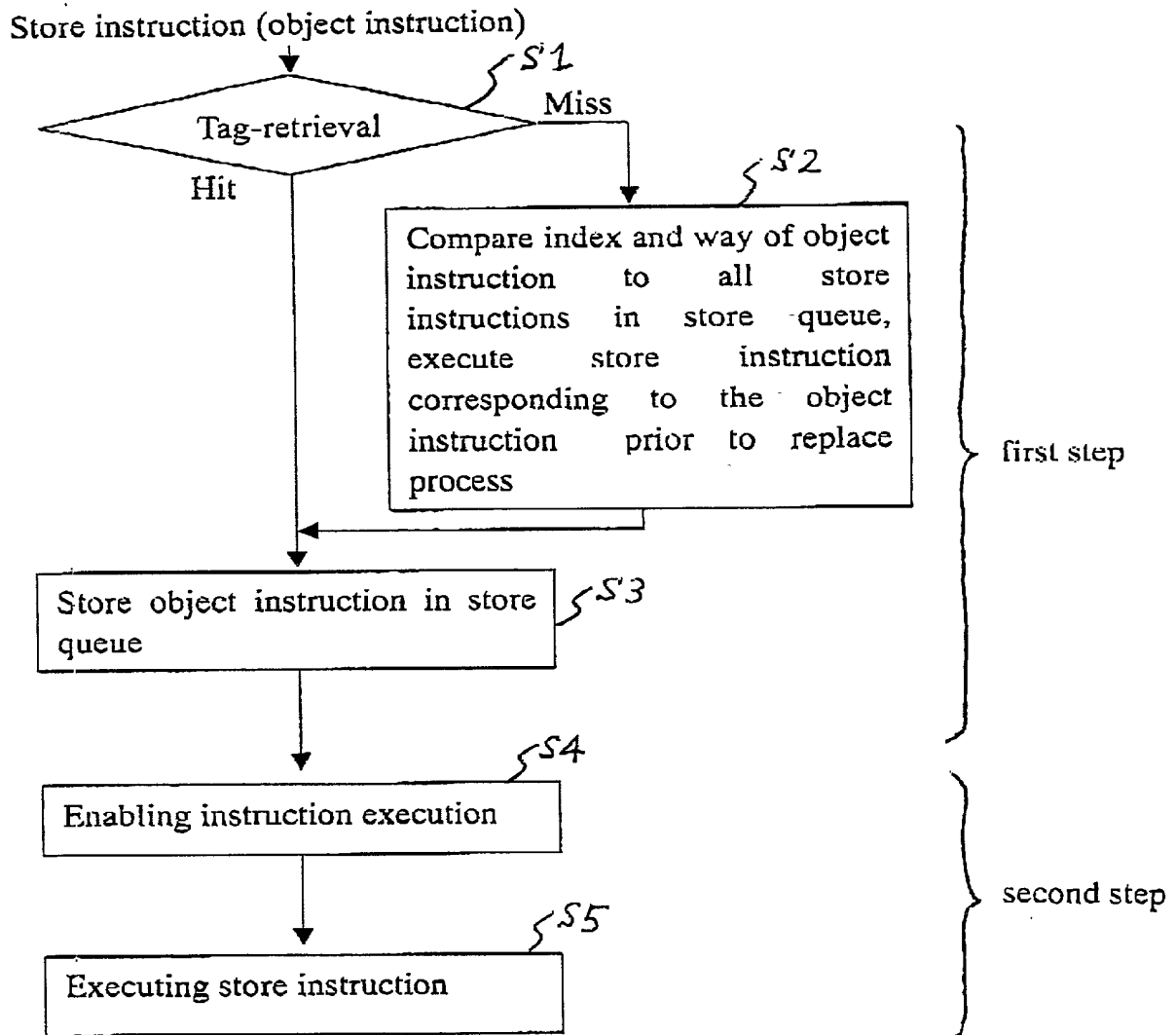
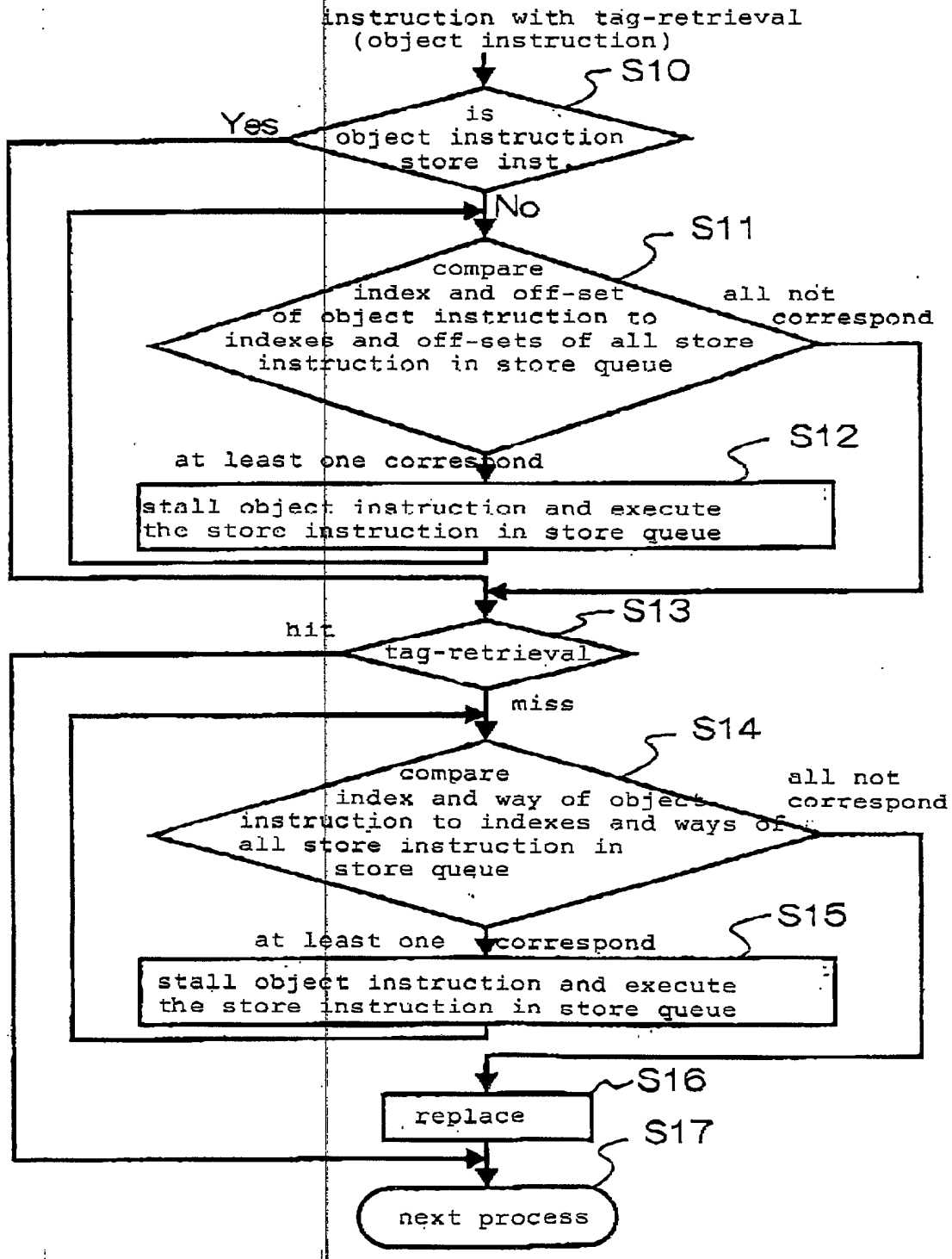


FIG. 10



20061014 013002

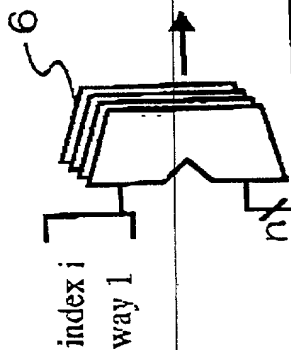
FIG. 11

tag-memory

index

tag-memory	
...	...
1	page frame no. A
2	page frame no. B
1	...
0	...
way 0	
way 1	

page frame no. A \neq page frame no. C
page frame no. B \neq page frame no. C
tag-retrieval : miss
replace object : way = 1



ID	page frame no.	index	off-set	way
0		i+1		
1	page frame no. B	i	x	1
2	page frame no. A	i	y	0
...
n-1				

load instruction
page frame no. C
index "i"
off-set "z"

FIG. 12

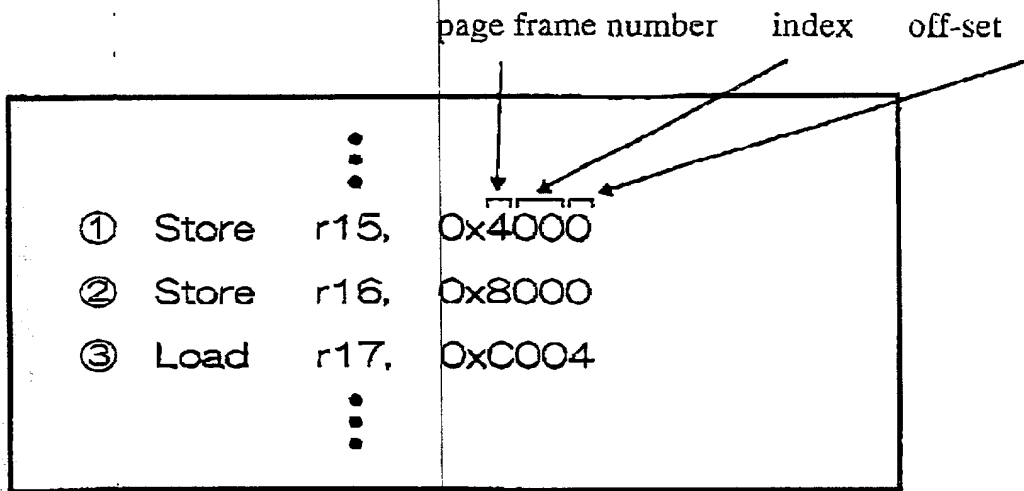


FIG. 13

		object way	way index "00" way 0 / way 1	result
a	① Store tag-retrieval : miss	0	indefinite 8	0
b	replace	0	4 8	0
c	② Store tag-retrieval : hit	1	4 8	0
d	③ Load tag-retrieval : miss	0	4 8	1
e	① Store write	0	4 8	1
f	replace (write-back + refill)	0	C 8	0

FIG. 14A

①	Store	r15, 0x4000
②	Load	r17, 0x4128

FIG. 14B

①	Store	r15, 0x4000	→	way 0
②	Store	r16, 0x8000	→	way 1
③	Load	r17, 0xC004	→	way 0

FIG. 15A

- | | | | |
|---|-------|------|--------|
| ① | Store | r15, | 0x4000 |
| ② | Load | r17, | 0x4000 |

FIG. 15B

- | | | | |
|---|-------|------|--------|
| ① | Store | r15, | 0x4000 |
| ② | Load | r17, | 0x8000 |